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PRODROMUS

OF A STUDY OF

North American Fresh Water Algæ.

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PRODROMUS OF A STUDY OF THE FRESH WATER ALGAE
OF EASTERN NORTH AMERICA.

BY HORATIO C. WOOD, Jr.,

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For several years all the leisure, my more strictly professional duties allow me, has been devoted to the study of the Alga-fauna of our inland waters, and I had intended delaying publication until ready to offer to the scientific world an elaborate memoir upon the subject. The field is however so constantly enlarging, that the day of final preparation seems rather to recede than draw near. This and the hope of stirring up other laborers, have induced me to print now a very brief abstract of the results that have so far rewarded my efforts. In enumerating and describing the species herein contained, I shall follow the classification and arrangement adopted by Rabenhorst in his "Flora Europæa Algarum." It should, however, be plainly understood that I do not do this, as endorsing the method of the German Professor, but simply because I do not feel prepared at present to discuss the natural arrangement of this group, and desire to leave the whole subject for a future Memoir.

The desire of enlisting the assistance various of observers, as already mentioned, has been one of the motives that have prompted me to publish at this time. I am already greatly indebted to several botanists for aid, amongst whom I may mention Dr. J. S. Billings, U. S. A., Professor H. W. Ravenel, and Mr. William Canby, and am thereby emboldened to ask for more. If there are any persons engaged in the study of these plants, I will be most happy to exchange specimens with them, either fresh or mounted for the microscope; and when occasion may arise, will most freely give all the credit due them for species new to America or Science. If there are others willing to help me, I will do all in my power to aid them in return by labelling specimens, giving information as to books, &c., or make such other returns as circumstances will permit. Any one who is thus willing had better address me by letter, when I will forward to him preservative fluid, with some directions.

A certain amount of experience and knowledge of the subject greatly facilitates the collection of these plants, but scarcely so much as in other departments of cryptogamic botany. Most of the species of fresh water algae are so small that the most experienced algologist does not know how great the reward of the day's toil may be until he places his booty on the object glass of his compound microscope. In order to aid any one who is desirous of collecting and studying these low forms, it seems to me not amiss to make here a few remarks upon the where and the when to look, and the how to preserve after they are found.

There are three or four distinct classes of localities, in each of which a distinct set of forms may be looked for. Stagnant ditches and pools; springs, rivulets, large rivers, and other bodies of pure water; dripping rocks in ravines, &c.; trunks of old trees, boards, branches and twigs of living trees and other aerial localities.

In regard to the first of these—*stagnant waters*—in these the most conspicuous forms are *oscillatoria* and *zygnemaceae*. The *oscillatoria* may almost always be recognized at once, by their forming dense, slimy strata, floating or attached, generally with very fine rays extending from the mass like a long, delicate fringe. The stratum is rarely of a bright green color, but is mostly dark; dull greenish, blackish, purplish, blue, &c. The *oscillatoria* are equally valuable as specimens at all times and seasons, as their fruit is not known, and the characters defining the species do not depend upon sexual organs. The *zygnemas* are the bright green, evidently filamentous, slimy masses, which float on ditches or lie entangled amongst the water plants, sticks, twigs, &c., in them. They are only of scientific value when in fruit, as it is only at such times that they can be determined. Excepting in the case of one or two very large forms, it is impossible to tell with the naked eye with certainty whether a *zygnema* is in fruit or not; but there are one or two practical points, the remembrance of which will very greatly enhance the probable yield of an afternoon's search. In the first place, the fruiting season is in the spring and early summer. The latter part of March, May and June are the months when the collector will be best repaid for looking for this family. Again, when these plants are fruiting they lose their bright green color and become dingy, often yellowish and very dirty looking—just such specimens as the tyro would pass by. The fine, bright, green, handsome masses of these algae are rarely worth carrying home. After all, however, much must be left to chance; the best way is to gather small quantities from numerous localities, keeping them separate until they can be examined.

Adhering to the various larger ditch plants, to floating matters, twigs and stones, &c., will often be found filamentous algae, which make fine filmy fringes around the stems, or on the edges of the leaves; or perchance one may meet with *rivularia* or *nostocs*, &c., forming little green or brownish balls, or indefinite protuberances attached to small stems and leaves. These forms are, however, to be looked for especially later in the season. Whenever seen, they should be secured.

In the latter part of summer, there is often a brownish gelatinous scum to be seen floating on ditches. Portions of this should be preserved, as it frequently contains interesting *nostocs* and other plants.

In regard to large *rivers*, the time of year in which I have been most successful in such localities, is the latter summer months. *Springs* and small bodies of clear water may be searched with a fair hope of reward at any time of the year when they are not actually frozen up. I have found some exceedingly beautiful and rare algae in such places as early as March, and in open seasons they may be collected even earlier than this. The *desmids* are most abundant in the spring, and possibly most beautiful then. They, however, rarely conjugate at that time, and the most valuable specimens are therefore to be obtained later—during the summer and fall months; at least, so it is said; and the little experience I have had with this family seems to confirm it. *Rivulets* should be watched especially in early spring, and during the summer months.

From the time when the weather first grows cool in the fall, on until the cold weather has fairly set in, and the reign of ice and snow commences, is the period during which the algae hunter should search carefully all wet, *dripping rocks*, for specimens. Amongst the dew bearing stems of wet mosses—in dark, damp crevices, and little grottoes beneath shelving rocks—here, at this season, is the algae harvest to be reaped. Nostocs, palmellas, conjugating desmids, sirosiphons, various unicellular algae, then flourish in such localities. My experience has been, that late in the fall, ravines, railroad cuttings, rocky river-banks, &c., reward time and labor better than any other localities.

The vaucherias, which grow frequently in wet ground, as well as submerged, fruit in the early spring and summer in this latitude, and are therefore to be collected at such times, since they are only worth preserving when in fruit.

In regard to algae which grow on trees, I have found but a single species, and do not think they are at all abundant in this latitude. Farther south, if one may judge by Professor Ravenel's collections, they are the most abundant forms.

As to the preservation of the algae—most of the submerged species are ruined by drying. Studies of them should always, when practicable, be made whilst fresh. Circumstances, however, will often prevent this, and I have found that they may be preserved for a certain period, say three or four months, without very much change, in a strong solution of acetate of alumina. If this is not to be had, I would recommend a trial of a preservative liquid, made of glycerine, carbolic acid (creasote of the shops), and water. This mixture might be made by dissolving half an ounce of pure carbolic acid (a little more of the impure), in three fluid-ounces of glycerine, and adding a full pint of pure water.

Almost all species of algae which are firm and semi-cartilaginous, or almost woody in consistency, are best preserved by simply drying them, and keeping them in the ordinary manner for small plants. When studied, fragments of them should be soaked in water.

The only satisfactory way that algae can be finally prepared for the cabinet is by mounting them whole, or in portions, according to size, for the microscope. Of the best methods of doing this, this is hardly the place to speak; but a word as to the way of cleaning them will perhaps not be out of place. Many of them, especially the larger filamentous one, may be washed by holding them fast upon an ordinary microscope slide, with a bent needle or a pair of forceps, and allowing water to flow or slop over them freely, whilst they are rubbed with a stiffish camels hair pencil or brush. In other cases, the best plan is to put a mass of the specimens in a bottle half full of water, and shake the whole violently; draw off the water from the plants in some way, and repeat the process with fresh additions of water, until the plants are well scoured. At first sight, this process would seem exceedingly rough, and liable to spoil the specimens, but I have never seen bad results from it, at least, when practised with judgment. The water seems so to envelope and protect the little plants that they are not injured.

After all, in many instances it appears impossible to clean these algae without utterly ruining and destroying them—the dirt often seeming to be almost an integrant portion of them; so that he who despises and rejects mounted specimens, simply because they are dirty and unsightly, will often reject that which, scientifically speaking, is most valuable and attractive.

In concluding this introduction, it is perhaps pardonable to state, that there are in my possession elaborate descriptions and drawings (from nature) of nearly all the plants mentioned in this paper, and that of the species mentioned, all but a dozen or two are new to science or new to this continent.

CLASS PHYCOCHROMOPHYCEAE.

ORD. CYSTIPHORAE.

FAM. CHROOCOCCACEAE.

GEN. CHROOCOCCUS.

C. REFRACTUS. *Sp. Nov.*

C. cellulis in familias solidas arcte consociatis, plerumque subquad-ratis, saepius triangularibus, rare multiangulis; familiis saepius lobatis; cytiodermate tenui, vix visibile, achroo; cytioplasmate subiliter granulato, subfusco vel subluteo, valde refringente.

C. Cells closely associated together into solid families, mostly sub-quadrate, very often triangular, rarely multiangular; families often lobed; cytioderm thin, scarcely perceptible, transparent; cytioplasm finely granular, brownish or yellowish, highly refractive.

Diam. cell. $\frac{1}{3000}''$ $\frac{1}{3000}''$, rare in cellulis singulis $\frac{1}{2000}''$; famil. $\frac{1}{1500}''$ $\frac{1}{170}''$.

Hab. In rupibus irroratis prope Philadelphia.

C. MULTICOLORATUS. *Sp. Nov.*

C. in strato mucoso inter algas varias sparsus; cellulis singulis sphaericis, vel 2-4 (rare 8) aut angulis aut semisphaericis aut abnormibus in familias oblongas consociatis; cytiodermate crasso, hyalino, haud lamel-oso; tegumentis plerumque nullis, interdum subnullis; cytioplasmate plerumque homoganeo, interdum subiliter granulato, vel luteo-viride vel caeruleo-viride vel luteo vel subnigro, vel brunneo, vel saturate aurantiaco, saepe ostro tincto.

Diam. cell., sing. sine tegm., $\frac{7}{9000}''$ cum teg. $\frac{2}{1500}''$; cell. in famil. sing. $\frac{2}{4500}''$ — $\frac{4}{4500}''$. Fam. long. $\frac{7}{4500}''$ — $\frac{10}{4500}''$; lat. $\frac{6}{4500}''$ — $\frac{7}{4500}''$.

C. Occurring scattered in a mucous stratum with other algae; cells spherical and single, or else angular semisphaerical or irregular and associated together in oblong families of from 2-4 (rarely 8); inner coat thick, hyaline, not lamellate; outer coat generally wanting, sometimes indistinctly present; endochrome mostly homogeneous, sometimes minutely

granular, either a yellowish green or bluish green, or yellowish, or brown, or blackish, sometimes tinged with bright lake.

Hab. In rupibus humidis prope Philadelphia.

GEN. GLOEOCAPSA.

G. SPARSA. *Sp. Nov.*

G. in strato mucoso sociis algis variis sparsa; cellulis sphaericis, vel oblongis vel ovatis, 2-8 in familias consociatis; familiis subglobosis vel subovatis, interdum numeroso-aggregatis; tegumentis internis aureofuscis, firmis, rarissime coloris expertibus, homogeneis, vel lamellosis; tegumentis externis achromaticis, rare subachromaticis, plerumque vix visibilibus; cytoplasmate homogeneo.

Diam. max. cell. oblong. sine tegum. long., $\frac{1}{3000}''$; lat., $\frac{1}{7500}''$; cell. glob., sine tegum., $\frac{1}{5000}''$; cum tegum., $\frac{1}{1875}''$; fam., $\frac{1}{750}''$.

G. scattered in a mucous stratum composed of various algae; cells spherical, or oblong, or ovate, associated together in families of from 2-8; families subglobose or subovate, sometimes aggregated together in large numbers; inner tegument yellowish brown, firm, rarely colorless, homogeneous or lamellate; external tegument achromatic, rarely subachromatic, generally scarcely visible.

GEN. MERISMOPEDIA.

M. CONVOLUTA. *Bréb.*

Hab. Prope Philadelphia.

Remarks.—I have only a slide of specimens, which were given me by my friend Dr. J. Gibbons Hunt. Our American form seems to be too close to the European species to be separated from it, although in no case is the frond in any wise plicate or convolute, and the cells are somewhat smaller (long diameter, $\frac{1}{5000}''$).

M. NOVA. *Sp. Nov.*

M. thallo membranaceo, distincte limitato, cellulis numerosissimis composito; cellulis ovalibus, arcte approximatis, 16 in familias consociatis, dilute caeruleo-viridibus, interdum medio constrictis; thalli marginibus rectis, integris.

Thallus membranaceous, distinctly limited, composed of very numerous cells; cells oval, closely approximated, consociate in families of 16, light bluish green, sometimes constricted in the middle; margin of the thallus straight and entire.

Diam. cell. ad. $\frac{1}{4000}''$.

Hab. In flumine Schuylkill, prope Philadelphia.

FAM. OSCILLARIACEAE.

GEN. OSCILLATORIA.

O. NIGRA. *Vauch.*

In stagnis prope Philadelphia.

Remarks.—Our American form does not quite equal the measurements given by Rabenhorst. I have never measured it over $\frac{1}{3400}$ " in diameter.

O. LIMOSA. (*Roth.*) *Agh.*

Hab. In stagnis prope Philadelphia.

Remarks.—The dissepiments are never granulate, at least that I have seen. Otherwise our American forms agree in all respects with the descriptions of the European.

O. NEGLECTA. *Sp. Nov.*

O. trichomatibus modice brevibus, aut dilute purpureo-plumbeis aut plumbeo-cinereis, plerumque rectis, aut stratum mucosum atro-purpureum haud distincte radiante formantibus, aut in strato gelatinoso haud radiante subplumbeo dispersis et cum algis aliis intermixtis, rare oscillantibus sed lente sese moventibus; articulis diametro fere 4 plo brevioribus; dissepimentis plerumque haud granulosis, rare indistincte granulosis; apiculo obtuse rotundato, interdum breve nonnihil attenuato.

Filaments rather short, of a dilute purplish lead color, or leaden gray, generally straight, either forming a mucous, blackish purple stratum without marked rays, or diffused with other algae in a gelatinous mass, rarely oscillating but gliding; articles about four times shorter than broad; joints for the most part not granulate, rarely indistinctly granulate; ends obtusely rounded, occasionally shortly somewhat attenuate.

Diam. $\frac{1}{1500}$ " = .0066.

Hab. In stagnis prope Philadelphia.

O. IMPERATOR. *Sp. Nov.*

O. in strato mucoso, plerumque natante, olivaceo-atro, longe radiante; trichomatibus rectis aut subrectis, tranquillis, dilute viridibus vel saturate olivaceis, haud oscillantibus, sed ambulantibus; apiculis nonnihil attenuatis, late rotundatis vel subtruncatis, curvatis; articulis diametro 5-12 plo brevioribus, ad genicula indistincte contractis; cytoplasmate homogeneo, olivaceo-viride; vaginis firmis, ad genicula distincte transverse striatis,

O. Occurring in an olive-black mucous stratum, mostly swimming and with long rays; filaments straight or straightish, light green or deep olive, tranquil, not oscillating, but moving with a gliding motion; ends somewhat attenuate, broadly rounded or subtruncate, curved; articles 5-12 times shorter than broad, slightly contracted at the joints; cytoplasm homogeneous, olive green; sheaths firm, distinctly transversely grooved at the joints.

Diam. .002."

GEN. LYNGBYA.

L. BICOLOR. *Sp. Nov.*

L. trichomatibus simplicibus in cæspites nigro-virides dense intricatis, varie curvatis, plerumque inarticulatis, interdum breve articu-

latis et ad genicula contractis; cytiodermate dilute caeruleo-viride, plerumque copiose granulato, saepe interrupto; cellulis perdurantibus cylindricis, saepe elongatis, saturate brunneis, sparsissimis; vaginis firmis, achrois, in trichomata matura modice crassis.

L. with the filaments closely interwoven into a blackish green mat; filaments variously curved, simple, mostly inarticulate, sometimes shortly articulate with the joints contracted; endochrome light bluish green, mostly very granulate, often interrupted; heterocysts cylindrical, often elongate, deep brown, very few; sheaths firm, transparent, in old filaments moderately thick.

Diam. $\frac{1}{1700}''$.

Hab. In flumine Schuylkill prope Philadelphia.

FAM. NOSTOCHACEAE.

GEN. NOSTOC.

N. CALCICOLA. *Ag.*

Hab. In rupibus prope Catoosa Springs, Georgia.—Prof. Ravenel.

Remarks.—The heterocysts in the American plant are both intermixed and terminal, otherwise the description of the European form is well answered. The region of country in which the specimen was collected is a limestone one. I am unable to say more positively whether the rocks on which it was growing were limestone or not.

GEN. SPHAEROZYGA.

S. POLYSERMA. *Rabenhorst.*

In stagnis prope Camden, New Jersey.

S. SUBRIGIDA. *Sp. Nov.*

S. natans; trichomatibus singulis, rectis aut subrectis, minimis, dilute viridibus; articulis cylindricis aut subglobosis, distinctis; sporis cylindricis, in medio gradatim nonnihil constrictis, singulis aut duplicis, sine cellulis perdurantibus inter se; cellulis perdurantibus brevecylindricis, singulis, distinctis.

S. Floating; filaments single, straight or straightish, very small, light green; articles cylindrical or subglobose, distinct; spores single or double, in the middle gradually a little constricted, not having a heterocyst between them; heterocysts shortly cylindrical, single, distinct.

Diam. cell. veg. trans. $\frac{1}{8000}'' = .00016$; spor. transv. $\frac{1}{4300}'' - \frac{1}{4500}'' = .00023'' - .00022''$; long. $\frac{1}{1500}'' = .00066''$; cell. perd. transv. $\frac{1}{4500}'' = .00022$.

Hab. In stagnis prope Philadelphia.

GEN. CYLINDROSPERMUM.

C. FLEXUOSUM. (*Ag.*) *Rabenk.*

Hab. In humo irrorato prope Philadelphia.

C. MINUTUM. *Sp. Nov.*

C. trichomatibus dilute aerugineis, plerumque flexuoso-curvatis et intricatis, interdum subrectis; articulis cylindricis, ad genicula plus minus constrictis, homogeneis vel granulatis; cellulis perdurantibus terminalibus, hirsutis, globosis; sporis ellipticis, diametro 2-3 plo longioribus, subtilissime granulatis.

Filaments light aeruginous green, generally curved and intricate, sometimes straightish; articles cylindrical, more or less constricted at the joints, homogeneous or granulate; heterocysts terminal, hirsute, globose; spores elliptical, 2-3 times longer than broad, very minutely granulate.

Diam. Artic. $\frac{1}{9000}$ ''; spor. long. $\frac{1}{1630}$ ''; transv. $\frac{1}{4000}$ ''.

Hab. In stagnis prope Philadelphia.

GEN. ANABAENA.

A. GELATINOSA. *Sp. Nov.*

A. thallo mucoso gelatinoso, indefinite expanso, dilutissime brunneo, nonnihil pellucido; trichomatibus haud vaginatis, leviter flexuoso-curvatis, nonnihil distantibus, haud intricatis, aut dilute aureis aut dilute caeruleo-viridibus; articulis globosis, homogeneis; cellulis perdurantibus articularum diametro fere aequalibus, globosis, vel rare oblongis; sporis terminalibus, singulis, globosis, (fusco-brunneis?)

Thallus gelatinous, mucous, indefinitely expanded, somewhat pellucid, with a brownish tinge; filaments not vaginate, somewhat curved, rather distant, not intricate, either a light golden yellow or light bluish green; joints globose, homogeneous; heterocysts about equal to the filament in diameter, globose or rarely oblong; spores terminal, globose.

Hab. Prope Philadelphia.

GEN. NOSTOCHOPSIS. *Gen. Nov.*

Trichomata ramosa cum cellulis perdurantibus aut in latere sessilibus aut in ramulorum brevissimorum apicibus dispositis. Vaginae nullae. Thallus definitus.

Thallus definite; filament branched; heterocysts sessile upon the sides of the filaments or raised upon the apices of short branches; sheaths none.

Remarks.—The curious plant upon which this genus is founded has the habit of a nostoc. The outer portion of the frond is condensed so as to give the appearance of a periderm; there is, however, no true periderm. The consistence of the thallus is that of a firm gelatinous mass. The trichomata or filaments radiate from the inner part of the frond towards the outer surface, but many of them take their origin in the outer portions of the thallus. In most places they are distinctly articulated, and indeed often seem to be composed of globular cells, resembling the filaments of a nostoc; on the other hand in certain portions they are not at all articulated. No sheaths are anywhere visible. The heterocysts are strangely enough never placed in the continuity of the

filaments. Sometimes they are sessile immediately upon the latter, sometimes they are raised upon very short branches. They are globose with rather thick walls. No spores were discovered. It seems to me best for the present to class this curious plant with the nostochaceae, although I am not altogether satisfied as to its affinities.

N. LOBATUS. *Sp. Nov.*

N. thallo vivide viride aut luteo-viride, cavo, enormiter lobato, natante, modice magno, firmo, gelatinoso; trichomatibus plerumque longis, flexuosis, dilute viridibus, plerumque articulatis, partim inarticulatis, cylindricis aut sub-moniliformibus, sparse granulatis.

Diam. trichom; cell. perdur.

Remarks.—I found this plant floating upon the Schuylkill river just above Manayunk. The hollow frond was buoyed up by a bubble of gas contained within it. It was an irregular, flattened, somewhat globose mass, of a bright green color and about $\frac{1}{2}$ an inch in diameter. It seems very probable that in its earlier condition, it was a solid attached frond. The long slender filaments are often very tortuous, but run a pretty direct general course towards the outer surface.

FAM. RIVULARIEAE.

GEN. GLOIOTRICHIA.

G. INCRUSTATA. *Sp. Nov.*

G. globosa vel subovalis, firma, solida, ad pisi minimi magnitudinem, dilute viridis, crystallophora; trichomatibus rectis aut leviter curvatis, in pilum productis, viridibus aut flavescentibus, saepe infra laete viridibus sed supra flavescentibus, haud ordinatim articulatis; articulis inferioribus in trichomatibus maturis brevibus, plerumque compressis; pilo apicale recto aut leviter curvato, plerumque indistincte articulo, saepe interrupto; vaginis amplis, achrois, saccatis, interdum valde constrictis; sporis cylindricis, saepe curvatis, diametro ad 9 plo longioribus; cellulis perdurantibus sphaericis.

Diam. trichoni. cum vag. γ_{500}'' — γ_{500}'' sporis max. γ_{500}'' — γ_{500}'' ; cell. perd. γ_{500}'' .

Frond globose or suboval, firm, solid about the size of a very small pea, light green, crystal bearing; filaments straight or slightly curved, produced into long hairs, green or yellowish, sometimes bright green in their proximal portions but yellowish above, not regularly articulate; lower articles in the mature filament short, and generally compressed; apical hair—like portion straight or slightly curved, mostly indistinctly articulate, frequently interrupted; sheath ample, transparent, saccate, sometimes strongly constricted; spores cylindrical, frequently curved, about 9 times as long as broad.

Hab. Schuylkill river, plantas aquaticas adhaerens.

GEN. RIVULARIA.

R. CARTILAGINEA. *Sp. Nov.*

R. subglobosa, parva, cartilaginea, saturate brunnea vel sub-atra, solitaria in plantis aquaticis:—trichomatibus maturis sterilibus rectis aut sub-rectis, cylindricis, elongatis, haud articulatis; cytoplasmate saepe interrupto; vaginis arctis et distinctis; cellulis perdurantibus globosis, diametro subaequalibus:—trichomatibus fertilibus rectis aut sub-rectis, supra spora cellulis 8-9 instructis; sporis elongatis, rectis, cylindricis; vaginis nonnihil crassis, arctis:—trichomatibus immaturis, breve articulatis; vaginis subamplis.

Frond subglobose, small, cartilaginous, deep brown or blackish, solitary upon aquatic plants: mature sterile filaments, cylindrical, elongated, not articulated, their cytoplasm frequently interrupted, their sheaths close and distinct, their heterocysts globose and about equal to them in diameter; fertile filaments straight or nearly so, above the spores furnished with 8 or 9 cells; spores elongate, straight, cylindrical; sheaths rather thick, close; immature filaments shortly articulate, their sheaths rather large.

Diam. trich. cum vag. $\frac{1}{2000}''$; spor. $\frac{1}{3000}''$.

Hab. In palude, Northern Michigan.

GEN. DASYACTIS.

D. MOLLIS. *Sp. Nov.*

D. parva, ad magnitudinem pisi minimi, enormiter subglobosa, mollis, gelatinosa, dilute viridis, haud distincte zonata; trichomatibus plerumque subrectis, partim distincte, partim indistincte articulatis; vaginis, in trichomatibus maturis haud visibilibus, in trichomatibus juvenibus supra subamplis; cellulis perdurantibus sub-globosis, globosis, vel ellipticis, diametro duplo majoribus, plerumque singulis sed interdum bi vel triseriatis.

Frond small, about the size of a small pea, irregularly subglobose, soft, gelatinous, light green, not distinctly zoned; filaments generally straightish, partly distinctly, partly indistinctly articulate; sheaths in the mature filament not perceptible; in the young filaments rather large in the upper portion; heterocysts subglobose or globose or elliptic, twice as large as the filament, generally single but sometimes bi or tri-seriate.

Diam. trich. $\frac{1}{8000}''$ — $\frac{1}{4500}''$; cell. perd. $\frac{1}{1800}''$.

Hab. In palude plantas aquaticas adhaerens, Northern Michigan.

GEN. MASTIGONEMA.

M. ELONGATUM. *Sp. Nov.*

M. initio subglobosum, postea saepe nonnihil fusinum, nigro-viride, lubricum, firme; trichomatibus aerugineis, valde elongatis, flagelliformibus, interdum inarticulatis sed saepius breve articulatis, interdum ad genicula valde constrictis; apice interdum truncato sed plerumque in pilo, longo, achroo, flexuoso, producto; vaginis achrois, arctis, saepe apice truncatis; cellulis perdurantibus globosis vel subglobosis.

Thallus at first subglobose, afterwards frequently fusiform, blackish green, slippery, firm; filaments aeruginous, very elongate, sometimes not articulated, but more generally shortly articulated, sometimes strongly contracted at the joints; apices sometimes truncate but generally produced into a long, flexuous, translucent hair; sheath transparent, close, frequently truncate at the apex; heterocysts globose or subglobose.

Diam. $\frac{2}{7500}'' = .00026''$

Hab. In aquario meo.

GEN. MASTIGOTHRIX.

M. FIBROSA. *Sp. Nov.*

M. trichomatibus dilute caeruleo-viridibus vel olivaceis vel sub-aerugineis, infra haud articulatis, supra saepe breve articulatis; apice in trichomatibus maturis in setam hyalinam, distincte articulata, longam, producta; vaginis achrois, in filamentis immaturis, distale distinctis, latis, hyalinis, infra modice crassis, aretis—in trichomatibus maturis infra aretis, et indistinctis, supra in fibetillis dissolutis, in apice, absentibus; cellulis perdurantibus globosis interdum geminis.

Filament either light bluish green or olivaceous or subaeruginous, below not articulate, its upper portion often shortly articulate; apex produced in the mature filament into a hyaline seta, which is long and distinctly articulate; sheath transparent—in the immature filament, distally distinct, broad, hyaline, but proximally close and rather thick—in the mature filament below close and rather indistinct, and superiorly dissolved in fibrillae so as to be entirely wanting at the apex; heterocysts globose, sometimes in pairs.

Diam. trichom. $\frac{1}{2250}''$; cell. perdur. $\frac{7}{18000}'' - \frac{4}{18000}''$.

Hab. In strato mucoso cum algis variis, in rupibus irroratis prope Philadelphia.

FAM. SCYTONEMEACEAE.

GEN. SCYTONEMA.

S. CATARACTA. *Sp. Nov.*

S. rupicola, caespitosum, fusco-atrum, longe et late expansum; trichomatibus flexuosis, flexilibus, fere 0.25'' longibus, vage pseudoramosissimis, superficie laeve; pseudoramis elongatis, singulis, rarissime geminis, liberis, interdum fuscis, saepius hyalinis, apice plerumque truncato, rare nonnihil attenuato, saepe barbato, haud rubello; trichomatibus internis aerugineis, tenuissimis, plerumque distincte articulatis; articulis diametro plerumque brevioribus, sed interdum longioribus, saepe sejunctis, saepe subglobosis; vaginis crassis et firmis; cellulis perdurantibus et basilaribus et interjectis, singulis, rarissime geminis.

Diam. trich. c. vag. plerumque .00045''; max. .0011''; sine vag. max. .00013''

S. Forming on rocks an extended turf-like stratum of a brownish

black color; filaments flexuous, flexible, almost 0.25'' long, irregularly branched, their surface smooth; branches elongate, single, rarely in pairs, free, sometimes fuscous, frequently hyaline, their apices generally truncate, rarely somewhat attenuate, frequently provided with enlargements, never reddish; cytioplasm aeruginous, very thin, generally distinctly articulate; articles mostly shorter than broad, but sometimes longer, frequently disjoined, often subglobose; sheaths thick and firm; heterocysts both basal and interjected, single, extremely rarely geminate.

Hab. In flumine Niagara prope cataractam.

S. CORTEX. *Sp. Nov.*

S. minutissimum, stratum tenue submembraneum formante; trichomatibus sparse pseudoramulosis, pseudoramulisque repentibus et plus minus concretis, viridibus aut dilute fuscis, varie curvatis, haud rigidis; cytioplasmate viride, articulado, rare distincte granuloso; articulis diametro longioribus aut brevioribus; vaginis arctis, nonnihil tenuibus, achrois, plerumque coloris expertibus, sed interdum dilute fuscis; cellulis perdurantibus et singulis et geminis, et basalibus et interjectis, globosis vel subglobosis.

S. Very minute, forming a thin, submembranaceous stratum; filaments sparsely branched, together with the branches, creeping and more or less concreted together by their sides, green or light brown, variously curved, not rigid; cytioplasm (internal filament) articulate, rarely distinctly granulate; joints longer or shorter than broad; sheaths close, rather thin, transparent, generally colorless but sometimes light brown; heterocysts globular or subglobular, single or in pairs, basal or otherwise.

Diam. trich. cum vag. $\frac{2}{7500}$ '' - $\frac{3}{7500}$ ''.

Hab. South Carolina in ramis (Platanus occidentalis). Prof. Ravenel.

S. RAVENELLII.* *Sp. Nov.*

S. lignicola, breve caespitosum, viride-nigrum; trichomatibus plerumque repentibus, vel fusco-olivaceis vel aureo-fuscis, modice pseudoramosis; ramis ascendentibus, rigidis, flexuosis rare pseudoramulosis, vel fusco-olivaceis vel aureo-fuscis, rarissime cum apicibus subachrois; trichomatibus internis coloris expertibus, granulosis, saepe vagina erumpentibus, plerumque articulatis; articulis diametro longioribus aut brevioribus; vaginis arctis, crassibus, fusco-olivaceis vel aureo-fuscis, plerumque supra truncatis et apertis, superficie nonnunquam irregulare; cellulis perdurantibus subquadratis, singulis, interjectis.

S. Forming little, shortly turf-like spots, on bark, of a greenish color; filaments mostly creeping, either brownish olive or yellowish brown, moderately branched; branches ascending, rigid, flexuous, very rarely provided with secondary branchlets, either brownish olive or yellowish

*It affords me great pleasure to dedicate this species to Prof. H. W. Ravenel as an acknowledgment, not so much of the aid rendered in my studies of our fresh water algae, as of his great services to science in some of her kindred branches.

brown, rarely subtransparent at the apex; cytoplasm colorless, granular, often extending out beyond the sheaths, generally articulate; joints longer or shorter than broad; sheaths close, thick, brownish olive or yellowish brown, for the most part truncate at their ends and open, their surface sometimes irregular; heterocysts subquadrate, single, interstitial.

Diam. trich. cum vag. $\frac{9}{7500}'' - \frac{6}{7500}''$; ram. c. v. $\frac{4}{7500}'' - \frac{6}{7500}''$.

Hab. South Carolina, in ramis Celtis. Prof. H. W. Ravenel.

GEN. SYMPHOSIPHON.

S. CORIACEA. *Sp. Nov.*

S. in strato ad 2 lineam crasso, coriaceo, nonnihil spongioso disposita; trichomatibus pseudoramulisque flexuosis, dense intricatis, arete concretis; trichomatibus internis rarissime haud articulatis sed plerumque breve et distincte articulatis, plerumque pallescentibus, interdum dilutissime aerugineis, saepe interruptis; articulis granulosis, interdum sejunctis, diametro subaequalibus ad fere duplo-longioribus; vaginis crassissimis, distincte lamellosis, achrois et coloris expertibus, stratis externis saepe intumescens, superficie corrugata, hirta; cellulis perdurantibus nullis?

S. Forming a leathery and spongy, tough stratum of about 2 lines in thickness and of a light slate color. Filaments and branches flexuous densely intricate, closely concreted; internal filament very rarely not articulated, in most cases very distinctly jointed, generally nearly colorless, sometimes with a faint aeruginous tint, often interrupted; articles granular, sometimes disjoined, from about equal to twice the length of their diameter; sheaths very thick, transparent and colorless, very distinctly lamellated, external lamella often swollen, their surface corrugate and variously rough and ragged; heterocysts none?

Diam. trich. c. vag. max. $\frac{10}{12000}'' = .00083$; sin. vag. max. $\frac{3}{12000}'' = .00025$.

Remarks.—I have examined a great number of filaments and have nowhere seen anything like a heterocyst. The specimens examined had been preserved in solution of acetate of alumina, but I do not think the salt had changed materially their color.

Hab. Texas. Prof. Ravenel.

GEN. TOLYPOTHRIX.

T. DISTORTA. (*Müller.*) *Ktz. Var.?*

In aquario. Dr. Fricke.

Remarks.—The specimens which have been identified as *T. distorta*, agree well with the descriptions of that species, except in the fact that the heterocysts are often 4-seriate and that they are rather parallelogrammatic than subglobose, as well as in the circumstance that the sheaths are close. I do not think the differences are sufficient to distinguish species.

FAM. SIROSIPHONEACEAE.

GEN. SIROSIPHON.

S. PULVINATUS. *Breb.*

Hab. In rupibus irroratis prope Philadelphia.

S. GUTTULA. *Sp. Nov.*

S. in maculis subnigris, parvis, tenuibus, plerumque rotundatis, interdum enormibus, dispositum; trichomatibus arcte intertextis, ramossissimis, rigidis, inaequalibus, subcylindricis, nonnihil contortis; ramulis abbreviatis vel nonnihil elongatis, apice obtuse rotundatis; ramulorum et trichomatum cellulis tri-multiseriatis, plerumque pachydermaticis, ferrugineo-fuscis, enormiter globosis, homogeneis; cellulis apicalibus interdum breve cylindricis, haud articulatis; vaginis sat amplis, luteo-brunneis vel dilute ferrugineo-brunneis.

Arranged in small, thin black spots, which are generally round, but sometimes irregular: filaments closely interwoven, very much branched, rigid, unequal, subcylindrical, somewhat contorted; branches abbreviate or somewhat elongate, apex obtusely rounded; cells of the trichoma and branches 3 to many seriate, mostly with thick coats, ferruginous-fuscous, irregularly globose, homogeneous; apical cells sometimes shortly cylindrical, not articulate, sheaths ample, yellowish brown.

Diam. max. trich. cum vag. $\frac{1}{750}'' = .0013$.

Hab. South Carolina, ad *Taxodium distichon* corticem. Prof. Ravenel.

S. ACERVATUS. *Sp. Nov.*

S. in guttulis minutissimis, subcrustaceis, nigris, in strato subcontinuo saepe aggregatis; trichomatibus parvis et brevibus, rigidis, admodum inaequalibus, prostratis, tuberculis, arcte et dense ramossissimis, viridibus aut aureis aut brunneis; ramulis brevibus, plerumque haud ramulosis, erectis aut ascendentibus, saepe abbreviatis, papilliformibus, obtusis, saepe lateraliter connatis; cellularum serie in trichomatibus multiplici in ramulis plerumque simplici; cellulis subglobosis vel subangularibus, viridibus, haud distincte granulosi, in ramulorum apice saepe breve cylindricis et interdum obsolete articulatis; vaginis aureis, nonnihil hyalinis.

Arranged in drops, which are very minute, subcrustaceous, black, and frequently aggregate into a subcontinuous stratum; filaments small and short, prostrate, rigid, somewhat unequal, tuberculate, densely and closely branched, green or golden or brown; branches short, for the most part not branched, erect or ascending, frequently abbreviate, papiliform, obtuse; series of cell multiple in trichoma, mostly simple in the branches; cells subglobose or subangular, green, not distinctly granulate, in the apices of the branches frequently shortly cylindrical and sometimes obsoletely articulate; sheaths golden, somewhat hyaline.

Hab. South Carolina, ad corticem (*Ilex opaca*). Prof. H. W. Ravenel.

Diam. trich. cum. vag. max. $\frac{1}{500}$ Ram. $\frac{3}{7500} - \frac{4}{7500}$

Remarks.—This species is closely allied to *S. coraloides*, but I think is distinct from it.

S. LIGNICOLA. Sp. Nov.

S. strato expanso, tomentoso, atro; trichomatibus ramossissimis, arcte intertextis; ramulis abbreviatis vel elongatis, subrectis aut varie curvatis, apicibus obtuse rotundatis vel subacuminatis; trichomatum et ramulorum cellulis uni vel biseriatis, plerumque pachydermaticis, dilute vel saturate aerugineis, enormibus, plerumque homogeneis; cellulis terminalibus elongatis, cylindricis, saepius nonnihil oscillatorium modo articulatis, granulosis; vaginis sat amplis, haud achrois, vel luteo-brunneis vel fuscentibus vel ferrugineis.

Occurring in an expanded, tomentose, black stratum; filaments very much branched, closely interwoven, branches abbreviate or elongate, nearly straight or variously curved, their apices obtusely rounded or subacuminate; cells 1-2 seriate, mostly thick walled, light or deep aeruginous, irregular, mostly homogeneous; terminal cells elongate, cylindrical, frequently articulate somewhat like an oscillatoria, granulate; sheaths somewhat ample, not transparent, light brown, fuscous or ferruginous.

Diam. trich. cum vag. max. $\frac{1}{1500}'' = .00066''$.

Hab. South Carolina; in lignis fabrefactis. Prof. H. W. Ravenel.

S. NEGLECTUS. Sp. Nov.

S. immersus; trichomatibus subsolitariis, longis usque ad lineas quatuor, cylindricis, ramossissimis; ramulis singulis; cytioplasmate interdum aerugineo, plerumque aureo-brunneo; cellulis uniseriatis rarissime biseriatis, subglobois, interdum sejunctis sed plerumque arcte connectis et moniliformibus, modo confluentibus, haud distincte pachydermaticis; cellulis terminalibus elongato-cylindricis, saepe nonnihil oscillatorium modo articulatis; cellulis interstitialibus nullis; vaginis achrois, interdum brunneis, plerumque coloris expertibus.

S. immersed, subsolitary, attaining a length of 4 lines, cylindrical, very much branched; branches single; cytoplasm aeruginous, mostly yellowish brown; cells uniseriate, very rarely biseriata, subglobose, sometimes separate but more frequently closely united and moniliform; terminal cell an elongated cylinder, often articulate somewhat like an oscillatoria; interstitial cells wanting; sheaths transparent, sometimes brown, mostly colorless.

Remarks.—This species is perhaps too close to *S. crameri*, but appears to differ from it very markedly in habit and place of growth.

Diam. trich. cum. vag. $\frac{1}{570} = .0017$; sine. vag. $\frac{1}{1000}''$

Hab. In stagnis prope Camden, New Jersey.

S. PELLUCIDULUS. Sp. Nov.

S. immersus; trichomatibus ramossissimis, solitariis vel subsolitariis; ramis plerumque unilateralibus, ramulosis; ramulorum apicibus late rotundatis, haud attenuatis; cellulis in seriebus simplicibus dispositis, in

trichomatibus nonnihil rotundatis, in ramulis saepe angularibus, plerumque compressis, diametro aequalibus—4 plo brevioribus, terminalibus cylindricis, obscure articulatis; cellulis interstitialibus nullis; vaginis arctis, hyalinis, haud lamellosis; cytioplasmate aerugineo vel brunneo, minute granulato.

S. immersed; filaments very much branched, solitary or subsolitary; branches mostly unilateral, branched; apices of the branches not attenuate, broadly rounded; cells disposed in a simple series, in the trichoma somewhat rounded, in the branches frequently angular, mostly compressed, equal to 4 times shorter than the diameter; terminal cell cylindrical, obscurely articulate; interstitial cells none; sheath close, hyaline, not lamellate; cytioplasm aeruginous or brown, minutely granulate.

Diam. trich. cum vag. $\frac{8}{7500}'' = .00106''$; sine vag. $.0008''$.

Hab. In stagnis, prope Hibernia Florida. Mr. Wm. Canby.

S. SCYTENEMATOIDES. *Sp. Nov.*

S. strato submembranaceo, nigro-viride, saepe interrupto, cum superficie inaequale; trichomatibus saepe arcte intricatis, flexuosis aut varie curvatis, haud rigidis, plerumque vix ramosis; cellulis uniseriatis, interdum interruptis, arctis, irregulare quadrangulis, diametro subaequalibus aut 1-3 plo brevioribus, haud distincte granulatis, caeruleo-viridibus; vaginis amplis, haud distincte lamellosis, superficie enormiter corrugatis et hirtis, achrois, plerumque coloris expertibus interdum dilute brunneis.

S. In a submembranaceous, blackish green, frequently interrupted stratum, with an uneven surface; filaments often closely intricate, flexuous or variously curved, not rigid, mostly sparsely branched; cells uniseriate, sometimes interrupted, close, irregularly quadrangular, about equal in length to their diameter, or about 1-3 times shorter, not distinctly granulate, bluish green; sheaths ample, not distinctly lamellate, their surface rough and corrugate, transparent, mostly colorless, sometimes light brown.

Diam. sine vag. max. $\frac{5}{7500}'' = .00066''$; cum vag. max. $\frac{10}{7500}'' = .0013''$.

CLASS CHLOROPHYLLOPHYCEAE.

FAM. PALMELLACEAE.

GEN. PALMELLA.

P. JESENII. *Sp. Nov.*

P. thallo indefinite expanso, initio dilute aut laete viride, molle, pellucidulo; aetate provecta firmo, tuberculoso, saturate olivaceo-viride; cellulis globosis vel ellipticis,—in thalli aetate immaturo, plerumque singulis aut geminis, saepe distantibus,—in aetate provecta saepe in familias connexis, plerumque confertis; tegumentis in thalli aetate immaturo plerumque diffuentibus, aetate provecta plerumque distinctis.

Thallus indefinitely expanded, in the beginning soft and pellucid, after-

wards firm, tubercular, deep olive green: cells globose or elliptical; in the immature thallus, single or geminate, frequently scattered; in the mature thallus often closely conjoined into families, mostly crowded; in the young thallus the teguments of the cells are mostly diffuent, afterwards distinct.

Diam. cell. glob. max. $\frac{1}{3500}'' = .00028$; cell. oblong. long. max. $\frac{1}{2500}'' = .0004$.

GEN. TETRASPORA.

T. LUBRICA. (*Roth*) *Ag.*

In aquis limpidis prope Philadelphia.

GEN. RHAPHIDIUM.

R. POLYMORPHUM. *Fresen.*

Hab. Prope Philadelphia.

FAM. PROTOCOCCACEAE.

GEN. SCENESDESMUS.

S. ACUTUS. *Meyen.*

Hab. Prope Philadelphia.

S. POLYMORPHUS. *Sp. Nov.*

S. cellulis fusiformibus, aut ovalibus aut ellipticis aut globosis, singulis aut 2-8 conjunctis, plerumque utroque polo aculeo unico, interdum aculeis duobus, instructis: apicibus obtusis, acutis, vel acutissimis; aculeis gracillimis, rectis, modice elongatis, inclinatis.

S. cells fusiform, or oval, or elliptic, or globose, single or 2-7 conjoined, furnished in most cases with a single spine, sometimes 2, at each end; ends obtuse, acute or very acute; spines exceedingly slender and acute, straight, moderately long, inclined.

Diam. $\frac{1}{2500}'' - \frac{1}{7500}''$; plerumque $\frac{1}{4000}''$.

Hab. In aquis quietis prope Camden, New Jersey.

GEN. HYDRODICTYON.

H. UTRICULATUM. *Roth.*

Hab. In stagnis prope Philadelphia.

GEN. PEDIASTRUM.

B. BORYANUM. (*Turpin.*) *Mengh.*

Hab. In stagnis prope Philadelphia.

FAM. DESMIDIEAE.*

GEN. PALMOGLOEA.

P. CLEPSYDRA. *Wood.*

P. saxicola et bryophila, in gelatina achroa interdum dilute viride nidulans; cellulis cylindricis, cum polis obtuse truncato-rotundatis, diametro 2-3 plo longioribus; lamina chlorophyllacea axili, plerumque indistincte, saepe nulla; plasmate dilute viride; nucleo plerumque distincto; zygosporis subfuscis aut subglobosis aut enormiter in clepsydræ forma; membrana externa enormiter excavata et sulcata.

P. living on rocks and mosses, swimming in a transparent, sometimes light green jelly; cells obtusely truncated, rounded at the ends, 2-3 times longer than broad; chlorophyll lamina axillary, mostly indistinct, often wanting; endochrome light green; nucleus generally distinct; zygosporæ subfuscous, either subglobose or of an irregular form, somewhat resembling that of an hour-glass; external coat irregularly excavated and sulcate.

Diam. $7\frac{13}{500}$ ''.

Hab. In rupibus et in muscis irroratis ad Cheltenham Hills, prope Philadelphia.

GEN. CLOSTERIUM.

C. EHRENBEGGII. *Menegh.*

Hab. Prope Philadelphia.

C. DIANAE. *Ehrb.*

Hab. Prope Philadelphia.

C. LUNULA.

Hab. Prope Philadelphia.

C. ROSTRATUM. *Ehrb.*

Hab. Prope Philadelphia,

C. SETACEUM. *Ehrb.*

Hab. Prope Philadelphia.

C. LINEATUM. *Ehrb.*

Hab. Prope Philadelphia.

C. LEIBLEINII. *Ktz.*

Hab. Prope Philadelphia.

C. PARVULUM. *Naeg.*

Hab. Prope Philadelphia.

C. ACEROSUM. (Schrank.) *Ehrb.*

Hab. Prope Philadelphia.

*I have paid so little attention to the Desmids that I intended at first to omit the family, but afterwards thought best to mention the few I have identified.

GEN. TETMEMORUS.

T. GRANULATUS. (*Bréb.*) *Ralfs.*

Hab. Prope Philadelphia.

GEN. PLEUROTAENIUM.

P. TRABECULA. (*Ehrb.*) *Naeg.*

Hab. Prope Philadelphia.

GEN. SPIROTAENIA.

S. BRYOPHILA. (*Bréb.*) *Rabenhorst.*

Hab. Prope Philadelphia.

GEN. MICRASTERIAS.

M. TRUNCATA. (*Corda.*) *Bréb.*

Hab. Prope Philadelphia.

M. JENNERI. *Ralfs.*

GEN. STAUSTRUM.

S. PUNCTUALATUM. *Bréb.*

Hab. Prope Philadelphia.

GEN. DIDYMOPRIUM.

DR. GREVILLI. *Ktz.*

Hab. Prope Philadelphia.

GEN. COSMARIUM.

C. CUCUMIS.

Hab. Prope Philadelphia.

C. BOTRYTIS. (*Bory.*) *Menegh.*

Hab. Prope Philadelphia.

FAM. ZYGNEMACEAE.

Remarks.—In this family I only enumerate such species as I have found in fruit, since there can be no certain identification of sterile plants. My list I am well satisfied, however, by no means completely represents the fauna of the neighborhood of Philadelphia.

GEN. RHYNCONEMA.

R. ELONGATA, *Sp. Nov.*

R. articulis vegetativis diametro 7-20 plo longioribus; articulis sporiferis multo brevioribus, valde tumidis; cytiodermate utroque fine protense et replicato; fascia unica, laxissime spirali; anfractibus plerumque 7; sporis ellipticis, diametro 1-2½ plo longioribus.

Sterile joints 7-20 times longer than broad; fertile joints much

shorter, greatly swollen; cell wall at each end produced or folded in; chlorophyll filament 1, spiral lax; turns mostly 7; spores elliptical, 2-2½ times longer than broad.

Diam. Spor. $\frac{8}{7500} = .00106$. Artic. vegetat. $\frac{4}{7500} .0005$.

Hab. In aquis limpidis prope Philadelphia.

R. PULCHELLA. *Sp. Nov.*

R. articulis sterilibus diametro 2-3 plo longioribus; sporiferis nonnihil tumidis; fascia unica; anfractibus 3-4; sporis ellipticis, diametro fere duplo longioribus; cytiodermate utroque fine protense et replicato.

Sterile joints 2-3 times longer than broad; fertile joints somewhat swollen; chlorophyll band one; turns of spiral 3-4; spores elliptical, almost twice as long as broad; cell wall at each end produced or folded in.

Diam. Artic. Steril. $\frac{4}{7500} - \frac{9}{7500} = .00033 - .0013$. Spar. $\frac{9}{7500} - \frac{10}{7500} = .0012 .00133$.

Hab. In stagnis prope Philadelphia.

GEN. SPIROGYRA.

S. WEBERI. *Ktz.*

Remarks.—The American form agrees pretty well with the European, but is however, larger, its cells also attain a greater proportionate length, and their chlorophyll bands have more turns. The lower limits of the American form are, however, so overlapped by the upper limits of the European, that it seems to me they must be considered identical.

Hab. In stagnis prope Philadelphia.

S. DUBIA. *Ktz.*

Remarks.—I have never seen the sporangial cell swollen in American specimens, in other respects the agreement is complete.

Hab. In stagnis prope Philadelphia.

S. QUININA. (*Ag*) *Ktz.*

Hab. In stagnis prope Philadelphia.

S. RIVULARIS. (*Hassall*), *Rabenhorst.*

Hab. In rivulis prope Hibernia, Florida. Mr. Wm. Canby.

S. LONGATA. (*Vauch*), *Ktz.*

Hab. In stagnis prope Philadelphia.

S. INSIGNIS. (*Hassall*), *Ktz.*

Hab. In stagnis prope Philadelphia.

S. PROTECTA. *Sp. Nov.*

S. saturate viridis, lubrica; articulis sterilibus diametro 6 plo longioribus; sporiferis vix tumidis; cytiodermate in cellulæ utroque fine protense et replicato; fascia unica; anfractibus 6; sporis oblongis vel ellipticis: membrano crassissimo.

S. Deep green, slippery; sterile joints 6 times longer than broad; fer-

tile cells scarcely swollen; cell wall folded in at the ends; chlorophyll band single; turns 6; spores oblong or elliptical, spore wall very thick.

Diam. Art. steril. $\frac{11}{500}'' = .00146$; spor. lat. $\frac{10}{7500}'' - \frac{12}{7500}'' = .00133 - .0016$ long. $\frac{25}{500}'' = .0033$.

S. CRASSA. *Ktz.*

Hab. In stagnis prope Philadelphia.

S. DILUTA. *Sp. Nov.*

S. articulis sterilibus diametro subæqualibus ad duplo longioribus; fructiferis haud tumidis; fasciis spiralibus 5, angustissimis, laxis, valde nodosis; anfractibus plerumque $\frac{1}{2}$, interdum 1; zygosporis sparsis, late ellipticis vel ovatis aut globosis; cytodermate modice tenue, in utroque fine nec protenso nec replicato.

S. Sterile joints about as long as broad to twice longer, fertile cells not swollen; chlorophyll bands 5, exceedingly narrow, lax, strongly nodose; turns mostly $\frac{1}{2}$, sometimes 1; zygosporis few, broadly elliptical, ovate or globose; cell wall moderately thin, not infolded at the ends.

Diam. Artic. steril. $\frac{23}{500}'' = .003''$.

Hab. In stagnis prope Philadelphia.

S. PARVISPORA. *Sp. Nov.*

S. articulis sterilibus diametro 2-4 plo longioribus; fructiferis haud tumidis, diametro 1-2 $\frac{1}{2}$ plo longioribus; fasciis spiralibus 4, angustis, nodosis, anfractibus pluribus; zygosporis parvissimis, ellipticis, diametro 1 $\frac{1}{4}$ -2 plo longioribus; cytodermate utroque fine nec protenso, nec replicato.

Sterile joints 2-4 times longer than broad; fertile not tumid, 1-2 $\frac{1}{2}$ times longer than broad; chlorophyll bands 4, narrow, nodose; turns many; zygosporis very small, elliptical, 1 $\frac{1}{4}$ -2 times longer than broad; cell wall not infolded at the end.

Diam. Art. Steril $\frac{23}{500}'' = .003$ spor. diam. transv. $\frac{15}{7500}'' - \frac{17}{7500}'' = .002 - .0023$; long $\frac{21}{7500}'' - \frac{30}{7500}'' =$

Hab. In stagnis, Hibernia, Florida. Mr. Wm. Canby.

GEN. ZYGNEMA.

Z. INSIGNIS. (*Hassall*), *Ktz.*

Hab. In stagnis prope Philadelphia.

GEN. SIROGONIUM.

S. RETROVERSUM. *Sp. Nov.*

S. articulis sterilibus diametro 7-15 plo longioribus; fasciis spiralibus 1, rare 2, latis, granulatis; anfractibus 1-9; articulis fertilibus valde tumidis, retroversis, copulatione genuflexa et sine tubo connexivo; cytodermate nonnihil crasso, utroque fine protenso vel replicato; sporis ellipticis.

Sterile joints 7-15 times longer than broad; chlorophyll band 1, rarely 2, broad, granulate; turns 1-9; fertile article very tumid, retroverted;

union of cells without connecting tubes, genuflexuous; cytioderm somewhat thick, infolded at the ends; spores elliptical.

Diam. cell. steril. $\frac{9}{7500}'' = .0012$.

GEN. MESOCARPUS.

M. SCALARIS. *Hassal.*

Hab. In stagnis prope Philadelphia.

ORD. SIPHOPHYCEÆ.

FAM. HYDROGASTRÆ.

GEN. HYDROGASTRUM.

H. GRANULATUM. (*Linn.*). *Disv.*

Hab. In stagnis exsiccatis, Delaware. Dr. I. F. Billings.

FAM. VAUCHERIAEÆ.

GEN. VAUCHERIA.

V. GEMINATA. (*Vauch.*). *De C.*

Hab. In stagnis prope Philadelphia.

V. POLYMORPHA. *Sp. Nov.*

V. in cæspites dense intricata; thallo capillari, tenui; antheridia corniculata ex ramuli lateralis apice formati; ramulis fertilibus interdum et oogoniis et antheridiis instructis, interdum antheridiis solum; oogoniis plerumque geminis, interdum singulis, globosis vel ovatis, sæpe brevirostratis, plerumque distincte pedunculatis sed rarius sessilibus; oosporis enormiter subglobosis vel ovatis; sporodermate achroo e stratis duobus composito.

Cæspitose; thallus hair like, thin; antheridia corniculate, formed of the apex of lateral branches; fertile branches sometimes furnished both with oogonia and antheridia, sometimes with antheridia alone; oogonia sometimes single but mostly in pairs, occasionally shortly rostrate, generally distinctly pedunculate but sometimes sessile; oospores irregularly subglobose or ovate, surrounded by a transparent double spore coat.

Hab. In aquis prope "Buffalo Bayou," Louisiana. Prof. H. W. Ravenel.

V. SERICEA. *Lyngb.*

Hab. In stagnis et humis irroratis prope Philadelphia.

V. AVERSA. *Hassal.*

Remarks.—I have found this species in the neighborhood of Philadelphia, if indeed it be a species. Prof. Rabenhorst thinks it probably merely a form of the preceeding and all the specimens I have seen appeared to run into it.

ORD. NEMATOPHYCEAE.

FAM. ULVACEAE.

GEN. SCHIZOMERIS.

S. LEIBLEINII. *Ktz.?*

See Proc. Biolog. and Microsc. Department, Ac. Nat. Sc. 1868, p. 12.

FAM. OEDOGONIACEAE.

O. MIRABILE. *Sp. Nov.*

O. gynandrum, rare setigerum; articulis diametro 2-8 plo longioribus; oogoniis plerumque singulis, rare geminis, nonnihil ovatis, infra latis sed supra contractis et medio tumidis; poris lateralibus duobus supra medium positis; oosporis aut late ovalibus aut subglobosis; sporodermate haud signato; antheridiis plerumque bicellularibus, interdum tricellularibus, plerumque in filo vegetativo infra oogonium aut in oogonio insidentibus; spermatozoideis singulis et geminis.

O. gynandrous, rarely setigerous; articles 2-8 times longer than broad; oosporangia mostly single, rarely geminate, subovate, in the lower portion broad, in the middle swollen, in upper part contracted; the 2 lateral pores situated above the middle; oospore subglobose or broadly ovate; it coats without markings; antheridia generally bicellular, sometimes tricellular, numerous, placed generally upon the female filament either upon or below the oosporangia.

Diam. Artic. veget. $\frac{3}{500}'' - \frac{13}{500}'' = .0004-0017$. Spor. $\frac{18}{500}'' - \frac{20}{500}'' = .0024'' - .0027''$.

H. ab. In rivulis quietis prope Philadelphia.

O. HUNTII. *Wood. (American Naturalist.)*

Hab. In aquario meo.

O. INEQUALE. *Sp. Nov.*

O. dioicum; cellula basali biloba; plantis femines quam plantis masculis permulto majoribus; oogoniis enormiter globosis vel subovoideis, poro laterale supra medium posito instructis; oosporis forma eadem, sed paulo minoribus.

O. dioecious, basal cell bilobate; feminine plant very much larger than the male plant; oosporangium irregularly globose or subovoidal, opening by a lateral pore above the middle; resting spores of the same form as the sporangium but a little smaller.

Hab. In stagnis prope Philadelphia.

O. MULTISPORUM. *Sp. Nov.*

O. gynandrum; oogoniis singulis, vel binis vel ternis continuis, globosis; pore laterale distale instructis; oosporis globosis, oogonii lumen replentibus; antheridiis plerumque pluribus planta feminea insidentibus, cellula inferiori multo majore.

O. gynandrous: oosporangia single or bi or triseriate, globose, about

the same size as the sporangial cavity; antheridia bi or tricellular, curved, with the lower cell much the largest, generally adhering in considerable numbers to all parts of the female plant.

Hab. In stagnis prope Philadelphia.

GENUS BULBOCHAETE.

B. CANBYII. *Sp. Nov.*

B. permagna ad .035'' longa, sparse ramosa; articulis sterilibus diametro 2-8 plo longioribus; oogoniis lateralibus vel in ramulorum apicem positis, transverse enormiter ovalibus; oosporis, transverse enormiter ovalibus, plerumque nonnihil triangularibus, oogonii lumen replentibus; sporodermate crasso, haud costato, enormiter punctato; antheridiis bicellularibus.

B. very large, attaining a length or more than one-third an inch, sparsely branched; sterile joints 2 to 8 times longer than broad; oosporangia lateral or placed upon the ends of branches, irregularly transversely oval; oospores of a similar shape often a little triangular, filling the cavity of the sporangium; spore coat thick, not costate but irregularly punctate.

Diam. cell. steril. $\frac{5}{7500}$ '' - $\frac{8}{6500}$ '' = .00066-001. Spor. transv. $\frac{17}{7500}$ '' = .00226.

Hab. In aquis quietis prope Hibernia, Florida, Mr. William Canby.

Remarks.—It affords me great pleasure to dedicate this very handsome species to Mr. William Canby, as an acknowledgment of favors received, and as a testimony of respect and high personal regard for him as a man, and as being among the foremost students of American phanerogamic botany.

B. DUMOSA. *Sp. Nov.*

B. articulis diametro $1\frac{1}{2}$ -2 plo longioribus; oogoniis plerumque in ramorum brevissimorum apicibus positis sed interdum lateralibus, plerumque setam terminalem gerentibus; oosporis enormiter ovalibus aut ovatis, nonnihil indistincte longitudinaliter oblique subarcte striatis; antheridiis bicellularibus, stipite instructis, cellula basale medio tumida, supra saepe contracta.

Joints $1\frac{1}{2}$ -2 times longer than broad: oosporangia generally placed upon the ends of short branches but sometimes lateral, mostly carrying a terminal seta; resting spores irregularly oval or ovate, somewhat indistinctly obliquely longitudinally and rather closely striate; antheridia bicellular, furnished with a little stipe, their basal cell tumid in the middle, frequently contracted above.

Hab. In aquario meo.

B. IGNOTA. *Sp. Nov.*

B. sparse ramosa, elongata; articulis diametro max. ($\frac{1}{1500}$ '' = .0066) $1\frac{1}{2}$ -2 $\frac{1}{2}$ plo longioribus; oogoniis interdum lateralibus et sessilibus, interdum inter ramulorum cellulas vegetativas positis, dissepimento nullo; oosporis ovalibus, longitudinaliter nonnihil oblique et distante costatis, sporodermate nonnihil crasso; antheridiis 3-4 cellularibus, stipitatis.

B. sparsely branched, elongate with the joints $1\frac{1}{2}$ - $2\frac{1}{2}$ times longer than broad ($\frac{1}{1500}'' = .0066$); oosporangia sometimes lateral and sessile, sometimes placed upon the apex of a branch, sometimes situated in the length of the branches between their cells; the empty cell which supports them without dissepiment; oospores oval, filling closely the cavity of the spore case, longitudinally somewhat obliquely and distantly costate; spore coat rather thick; antheridia 3-4 celled, scarcely stipate.

Hab. In aquis quietis prope Philadelphia.

FAM. CHAETOPHORACEAE.

GEN. CHAETOPHORA.

C. PISIFORMIS (*Roth*) *Ag.*

Hab. In stagnis plantas, &c., adhaereus prope Philadelphia.

GEN. DRAPARNALDIA.

D. PLUMOSA (*Vauch.*) *Ag.*

Hab. In aquis quietis prope Philadelphia.

D. GLOMERATA (*Vauch.*) *Ag.*

Hab. In rivulis et stagnis et aquis limpidis quietis prope Philadelphia.

D. BILLINGSII *Sp. Nov.*

D. valde gelatinosa; filis et ramis primariis achrois ad $\frac{3}{7500}''$ crassis, sparsissime ramosis, articulis diametro 2-6 plo longioribus, saepe medio valde tumidis; fasciis chlorophyllis dilute viridibus, saepe nullis aut subnullis; ramulorum fasciculis distantibus, late ovalibus vel late triangularibus, alternantibus vel oppositis vel triplo verticellatis, sparse ramosis, patentissimis; ramulis cum pila longissima robusta terminale; oosporis globosis, moniliforme conjunctis; sporodermate crasso.

Frond very gelatinous, filament and primary branches attaining a diameter of $\frac{1}{250}''$, very sparsely branched, their articles 2-6 times longer than broad, often very much swollen in the middle; chlorophyll band light green, frequently almost or entirely wanting; fascicles of branches distant, broadly oval or triangular, alternate, opposite or in whorls of three, very open; ultimate branchlets terminating in a long, robust, hyaline hair; resting spores globose, with thick walls, arranged in long moniliform sometimes branched filaments.

Remarks.—I dedicate this very beautiful species to Dr. J. S. Billings, U. S. A., to whom I am under the greatest obligations for aid in the prosecution of this research, and whom I have ever found to unite the greatest scientific liberality to a strong enthusiasm for and able prosecution of the study of these lower vegetable forms.

Hab. In aquis limpidis quietis prope Philadelphia.

GEN. APHANOCHAETE.

A. REPENS *A. Braun.*

Hab. In algiis confervaceis prope Philadelphia.

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CLASS RHODOPHYCEAE.

FAM. PORPHYRACEAE.

GEN. PORPHYRIDIDIUM.

P. CRUENTUM. (Ag) Naeg.

Remarks.—A small piece of bone was sent me by my friend, Dr. Billings, on which were a few specks of this little organism. The bone had been picked up on Governor's Island, New York Harbor, and it is very possible that it was a fresh arrival from Europe. I have never met with traces of the species elsewhere.

P. MAGNIFICUM. Sp. Nov.

P. cellulis globosis vel subglobosis, rare nonnihil polygonis; cytoplasmate purpureo, granulato; cytodermate crasso, haud lamelloso.

Cells globose or subglobose, rarely somewhat polygonal; endochrome purple, granulate; cell wall thick, not laminate.

Diam. Cell cum. tegum. $\frac{24000}{24000}$ — $\frac{24300}{24000}$. Tegum. $\frac{30000}{30000}$ — $\frac{10000}{10000}$.

Hab. In terra humida, Texas. Prof. Ravenel.

FAM. CHANTRANSIACEAE.

GEN. CHANTRANSIA.

C. EXPANSA. Sp. Nov.

C. caespitosa, in lapide stratum saturate violaceo-purpureum lubricum, indefinite expansum formans; filis purpureis, modice ramosis, fere 2 lineas longis et ramis plerumque strictis et rectis, saepe elongatis; ramulis fertilibus brevibus, ascendentibus; articulis diametro 3-8 plo longioribus, extremis obtusis; polysporis in ramellis lateralibus racemosim et confertim cumulatis, ovalibus vel nonnihil obovatis.

Caespitose, forming a dark purple, slippery, indefinite stratum on stones; filaments purple, moderately branched, almost 2 lines long, together with the branches strict and straight, often elongate; infertile branches sometimes very few, sometimes very numerous; fertile branches short, ascending; joints 3-8 times as long as their diameter, the final articles obtusely rounded; polyspores racemose, crowded on the fertile branches, oval or somewhat ovate.

Diam. Fil. $\frac{1}{2500}$ ''=.0004'', *Spor.* transv. $\frac{1}{3650}$ ''=.00027 long. $\frac{1}{2500}$ ''=.0004''

Remarks.—I formerly referred this species very doubtfully to *C. violacea* Ktz., but am now convinced that it is distinct. Its size, mode of growth, and habit all are very different from those of that species.

Hab. In rivulis prope Philadelphia.

Whilst the above has been going through the press I have found floating on a "brick pond" the following new nostochaceous plant.

ANABAENA GIGANTEA. *Sp. Nov.*

A. thallo nullo, trichomatibus singulis et numeroso-consociatis, nantibus, rectis, in aetate juveni spiraliter convolutis; articulis plerumque subglobosis, arcte connexis, granulosi; cellulis perdurantibus interjectis, articulis vegetativis subaequalibus utroque polo punctiforme incrassatis, subsphaericis; sporis subsphaericis.

Thallus wanting; filaments occurring floating singly on water or in great numbers, straight, but in the young state often spirally convoluted; articles mostly subglobose, closely connected, granular, heterocysts subsphaerical, interstitial, a very little larger than the vegetative cells, thickened at each end in a punctiform manner; spore subsphaerical.

Diam. Artic. vegetat. max $\frac{11}{24000}$ = ——— Heterocysts $\frac{1}{2000}$ = .0005.
Spor. at. $\frac{11}{12000}$ = ——— Long. $\frac{1}{1000}$ = .001.

Remarks.—With the above anabaena was a *Caelosphaerium*, which appears to be the *C. dubium* Grun. In no instance, however, was the frond of nearly so great size as the European form is said to attain to.

I have also recently identified the following plants, new to this continent.

GEN. CLADOPHORA.

C. BRACHYSTELECHA. *Rabenk.*

Hab. In aquis prope Philadelphia.

C. FRACTA. *Dillw.*

Hab. In flumine Schuylkill.



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Wood

North American
fresh water algae

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